

REMARKS

Upon entry of the instant amendment, claims 1-2, 5-6, 9-11, 14-15, 18-21 and 34-35 will remain pending in the instant application and stand ready for further action on the merits.

In this Amendment, claims 1, 5-6 and 9-10 have been amended, and claims 3-4, 7-8, 12-13, 16-17 and 32-33 have been canceled.

The present amendments to the claims do not introduce new matter into the application as originally filed. As such entry of the instant amendment and favorable action on the merits is earnestly solicited at present.

Claim Rejection under 35 U.S.C. § 102(b)

Claim 32 is rejected under 35 U.S.C. § 102(b) as being anticipated by **Minakata et al. WO'599** (WO 2003/016599 A1).

Since the invention claimed in claim 32 of the present patent application has been canceled, the ground for rejection has been resolved, and therefore reconsideration and withdraw of the same is respectfully requested.

Claim Rejections under 35 U.S.C. § 103(a)

Claims 1-21 and 34-35 are rejected under 35 U.S.C. § 103(a) as being unpatentable over **Minakata US'010** (US 7,061,010 B2).

Claim 33 is rejected under 35 U.S.C. § 103(a) as being unpatentable over **Sparfel et al.** (Tetrahedron, 1980, 36(15), pages 2225-35).

Reconsideration and withdraw of the above rejections is respectfully requested based on the following considerations.

Legal Standard for Determining Prima Facie Obviousness

M.P.E.P. § 2141 sets forth the guidelines in determining obviousness. First, the USPTO has to take into account the factual inquiries set forth in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), which has provided the controlling framework for an obviousness analysis. The four *Graham* factors are:

- (a) determining the scope and content of the prior art;
- (b) ascertaining the differences between the prior art and the claims in issue;
- (c) resolving the level of ordinary skill in the pertinent art; and
- (d) evaluating any evidence of secondary considerations.

Graham v. John Deere, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966).

Second, the USPTO has to provide some rationale for determining obviousness. MPEP § 2143 sets forth some rationales that were established in the recent decision of *KSR International Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). Exemplary rationales that may support a conclusion of obviousness include:

- (a) *combining prior art elements according to known methods to yield predictable results;*
- (b) *simple substitution of one known element for another to obtain predictable results;*
- (c) *use of known technique to improve similar devices (methods, or products) in the same way;*
- (d) *applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;*
- (e) *“obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success*

- (f) *known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;*
- (g) *some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.*

As the M.P.E.P. directs, all claim limitations must be considered in view of the cited prior art in order to establish a *prima facie* case of obviousness. *See* M.P.E.P. § 2143.03.

Distinctions over the Cited Art

The non-obviousness of the invention recited in Claim 1

The invention claimed in claim 1 of the present patent application can not be easily thought of or arrived at based on the invention described in the cited reference **Minakata US'010**. In support of this contention the following points are more specifically noted.

Minakata US'010 discloses that, by introducing a photo reactive group and a photo polymerization group, a photosensitivity is added to the polyacene compound so that the invention is useful as a photo patterning material . This means that the photo reactive group and the photo polymerization group having the unsaturated bond are in the reaction state or polymerization state by irradiating the energy of radiation such as ultraviolet rays and others. **Minakata US'010** does not disclose a chemical structure or the characteristics (for instance, the stability) of the polyacene compound which determines the semiconductor characteristic.

On the other hand, an invention claimed in claim 1 of the present patent application discloses a polyacene compound having the great solubility and the oxidation resistance wherein

the solubility is improved for the polyacene compound which has the low solubility by introducing the functional groups such as alkyl group or alkoxy group in the positions of R₁, R₂, R₃ and R₄ (the displacement position in the major axis direction of the polyacene compound molecule) and the oxidation resistance is improved for the polyacene compound which has the low oxidation resistance by introducing halogen group(s) in the position of X (the displacement position in the minor axis direction of the polyacene compound molecule). That is, on the basis of the polyacene compound which has no functional groups, the solubility of the polyacene compound is improved by introducing the functional group such as an alkyl group or alkoxy group and the oxidation resistance of the polyacene compound is improved by introducing the halogen group.

As described above, the invention claimed in claim 1 of the present patent application and the invention disclosed in **Minakata US'010** are different. Further, **Minakata US'010** does not disclose that the number of the halogen groups is two and that they are bound to the same acene ring of the polyacene compound.

As shown in the attached documents **Exhibit I** – (Copy of Experimental Results originally filed on April 22, 2010 with 37 CFR § 1.111 Amendment) and **Exhibit II** – (Copy of 37 CFR §1.132 Declaration originally filed on May 21, 2010 with Supplemental Response), the polyacene compound, having alkyl group in the displacement position in the major axis direction of the polyacene compound molecule, is easily oxidized in the solution. The present invention is invented by introducing halogen group(s) in the displacement position which is easily oxidized, namely, by introducing two halogen groups which are bound to a same acene ring so that the oxidation resistance of the polyacene compound is dramatically improved.

As described above, the invention claimed in claim 1 of the present patent application is focused on an improvement of the characteristics (namely, solubility and oxidation resistivity) of the polyacene compound by introducing the functional group and is not focused on the reactive characteristic of the functional group itself as described in **Minakata US'010**. A description for suggesting a matter of improving the oxidation resistance by introducing the halogen group is not described in **Minakata US'010**.

Further, **Minakata US'010** discloses the organic semiconductor thin film, using the polyacene compound having the functional groups in the displacement position only in the major axis direction of the polyacene compound molecule or only in the minor axis direction of the polyacene compound molecule, expressing a high mobility.

In addition, **Minakata US'010** discloses a matter of which the carrier transport is interrupted since a matter of stacking the polyacene compounds, having the functional groups in the displacement positions in both major and minor axes, with each other is blocked.

Since the above-mentioned description in **Minakata US'010** denies the structure of the invention claimed in claim 1 of the present patent application, which has a characteristic of having the functional groups in the displacement positions in both major and minor axes of the polyacene compound molecules, **Minakata US'010** does not allow for introducing the structure of the invention claimed in claim 1 of the present patent application based on the invention disclosed in **Minakata US'010**.

As described above, since the invention claimed in claim 1 of the present patent application can not be easily arrived at by a person skilled in the art based on the invention disclosed in **Minakata US'010**, it follows that the invention recited in claim 1 of the present

patent application has is non-obvious over the invention disclosed in **Minakata US'010**. In this respect, no teaching or rationale is provided in the cited **Minakata US'010** reference that would allow one of ordinary skill in the art to arrive at the instant invention as claimed.

The inventive step of the invention claimed in Claims 2, 5-6 and 9

Since the invention recited in claims 2, 5-6 and 9 of the present patent application cites the invention recited in claim 1 and limits the same, and since the invention recited in claim 1 is non-obviousness over the cited art of record, it follows that the invention recited in claims 2, 5-6 and 9 is also non-obvious over the cited art of record.

The non-obviousness of the invention recited in Claim 10

Based on the same reason applied to the invention recited in claim 1 of the present patent application, it is also submitted that the invention recited in claim 10 of the present patent application is also non-obvious over the cited **Minakata US'010** reference.

The non-obviousness of the invention recited in Claims 11, 14-15 and 18-19

Since the invention recited in claims 11, 14-15 and 18-19 of the present patent application cites the invention recited in claim 10 and limits the same, and since the invention recited in claim 10 is non-obvious over the cited art of record, it follows that the invention recited in claims 11, 14-15 and 18-19 is also non-obvious over the cited art of record.

The non-obviousness of the invention recited in Claims 20-21

Since the invention recited in claims 20-21 of the present patent application cites the invention recited in claim 10, and since the invention recited in claim 10 is non-obvious over the

cited art of record, it follows that the invention recited in claims 20-21 is also non-obvious over the cited art of record.

The non-obviousness of the invention recited in claims 34-35

Since the invention recited in claims 34-35 of the present patent application cites the invention recited in claim 10, and since the invention recited in claim 10 is non-obvious over the cited art of record, it follows that the invention claimed in claims 34-35 is also non-obvious over the cited art of record.

The non-obviousness of the invention recited in Claim 33

Since the invention claimed in claim 33 of the present patent application has been canceled, the ground for rejection has been rendered moot, such that withdraw thereof is required at present.

Apart from the above considerations, it is earnestly submitted that nowhere in the cited art is there provided any reason or rationale that would allow one of ordinary skill in the art to arrive at the instant invention as claimed, including the advantageous properties that are possessed thereby.

CONCLUSION

Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance clearly indicating that each of the pending claims 1-2, 5-6, 9-11, 14-15, 18-21 and 34-35 is allowable under the provisions of Title 35 of the United States Code.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact John W. Bailey, Reg. No. 32,881 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Director is hereby authorized in this, concurrent, and future replies to charge any fees required during the pendency of the above-identified application or credit any overpayment to Deposit Account No. 02-2448.

Dated: October 14, 2010

Respectfully submitted,

By 

John W. Bailey

Registration No.: 32881

BIRCH, STEWART, KOLASCH & BIRCH, LLP

8110 Gatehouse Road, Suite 100 East

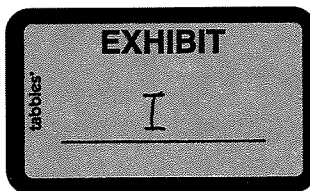
P.O. Box 747

Falls Church, VA 22040-0747

703-205-8000

Attachments: **Exhibit I** - Copy of Additional Experimental Results (8 pages) originally filed on April 22, 2010; and

Exhibit II - Copy of Declaration under 37 C.F.R. § 1.132 by Mr. Kazuto Nagata (9 pages) originally filed on May 21, 2010.



COPY

Your Ref. 2729-0117PUS1

Our Ref. AKK-US-0071-PCT

[Attached Document]

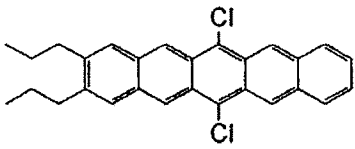
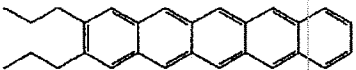
A verification of the effect of the oxidation resistance by introducing the halogen group:

An oxidation resistance of the 6,13-dichloro-2,3-di(n-plopyl) pentacene included in the invention claimed in claim 1 of the present patent application and an oxidation resistance of the 2,3-di(n-plopyl) pentacene without substituting the halogen group, as a comparison example, are examined.

[Method of Examination]

The orthodichlorobenzene-d₄(0.13wt%) solution of the 6,13-dichloro-2,3-di(n-plopyl) pentacene and the orthodichlorobenzene-d₄(0.13wt%) solution of the 2,3-di(n-plopyl) pentacene are prepared in the NMR tube at the normal atmosphere and both of them are heated for two hours at the temperature of eighty degrees Celsius by the oil-bath. The decomposed amount of the both cases of the pentacene were verified for a solution immediately after the solution was prepared and for a solution after the solution was heated, by measuring the ¹H NMR spectrum.

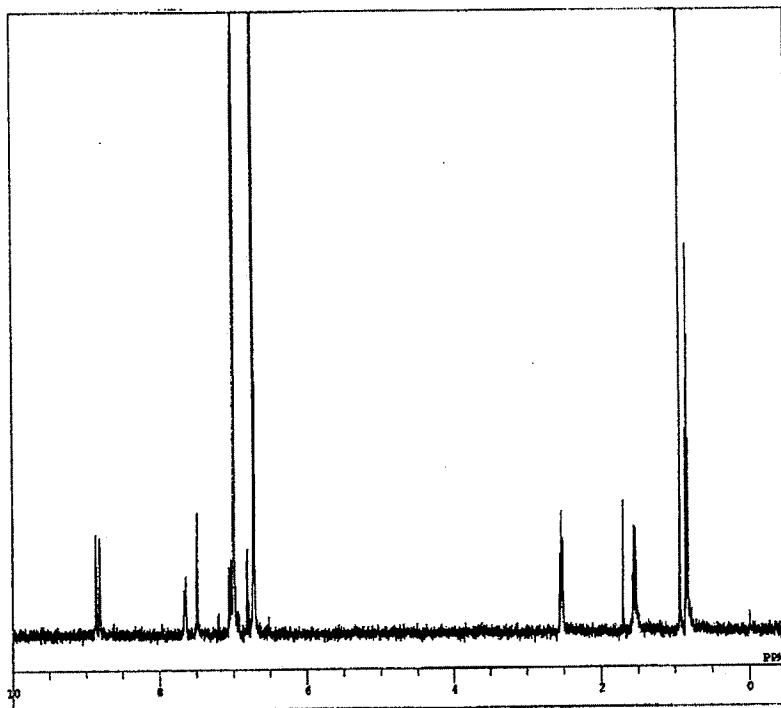
[Result]

| | Embodiment | Comparative Example |
|---|---|--|
| Chemical Compound |  6,13-dichloro-2,3-di(n-plopyl) pentacene |  2,3-di(n-plopyl) pentacene |
| Decomposition Rate (¹ H NMR) | Less than 15% | 100% |

The decomposed rate of the 6,13-dichloro-2,3-di(n-plopyl) pentacene is about 10% after two hours of heating compared with immediately after the solution was prepared. The main decomposed compound is the 2,3-di(n-plopyl)-6,13-pentacene quinone which is the oxidation-product (Please refer to FIGS. 1, 2 and 5). On the other hand, the 2,3-di(n-plopyl) pentacene has completely decomposed after two hours of heating, and the main product of the decomposed compound is also 2,3-di(n-plopyl)-6,13-pentacene quinone (Please refer to FIGS. 3, 4 and 6). This examination result strongly indicates an improving effect of the oxidation resistance by introducing the halogen group (Cl atoms).

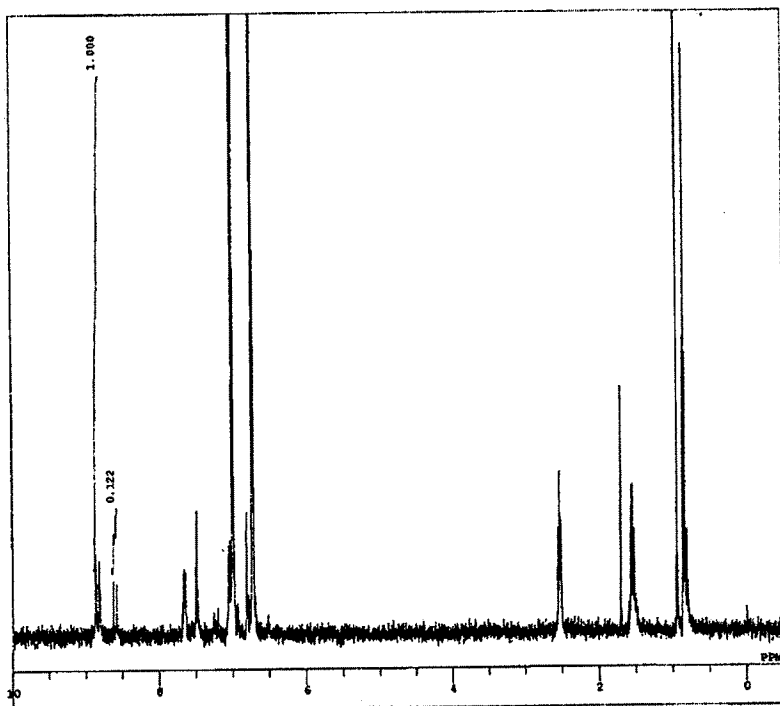
[FIG. 1]

The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene immediately after the solution was prepared.



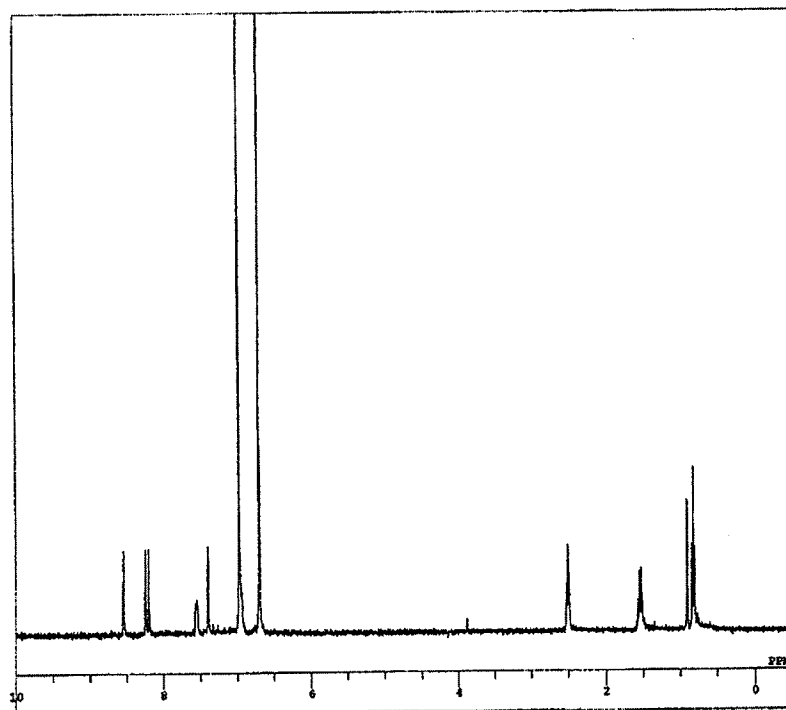
[FIG. 2]

The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene after the solution was heated for two hours.



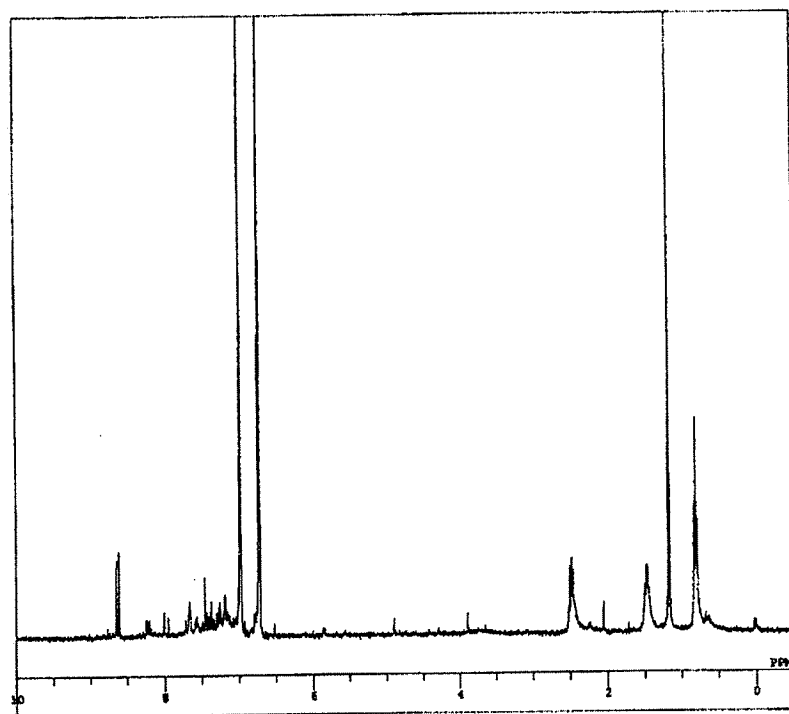
[FIG. 3]

The ^1H NMR spectrum of the 2,3-di(n-plopyl) pentacene immediately after the solution was prepared.



[FIG. 4]

The ^1H NMR spectrum of the 2,3-di(n-plopyl) pentacene after the solution was heated for two hours.

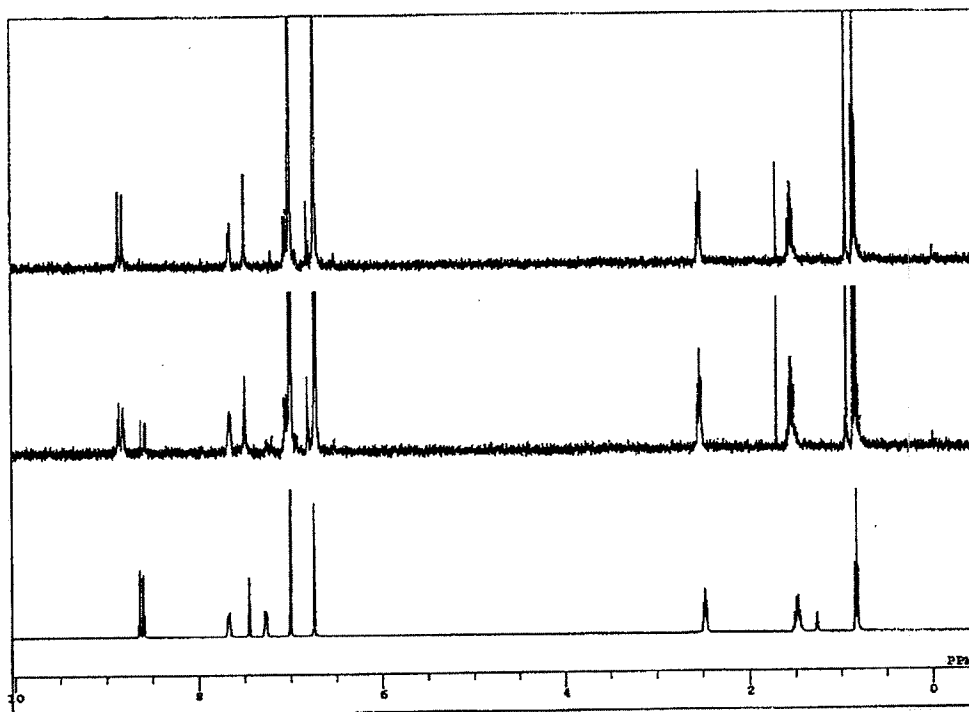


[FIG. 5]

Top Line: The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene immediately after the solution was prepared (same spectrum as shown in FIG.1).

Middle Line: The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene after the solution was heated for two hours (same spectrum as shown in FIG.2).

Bottom Line: The ^1H NMR spectrum of the 2,3-di(n-plopyl)-6,13-pentacene quinone.

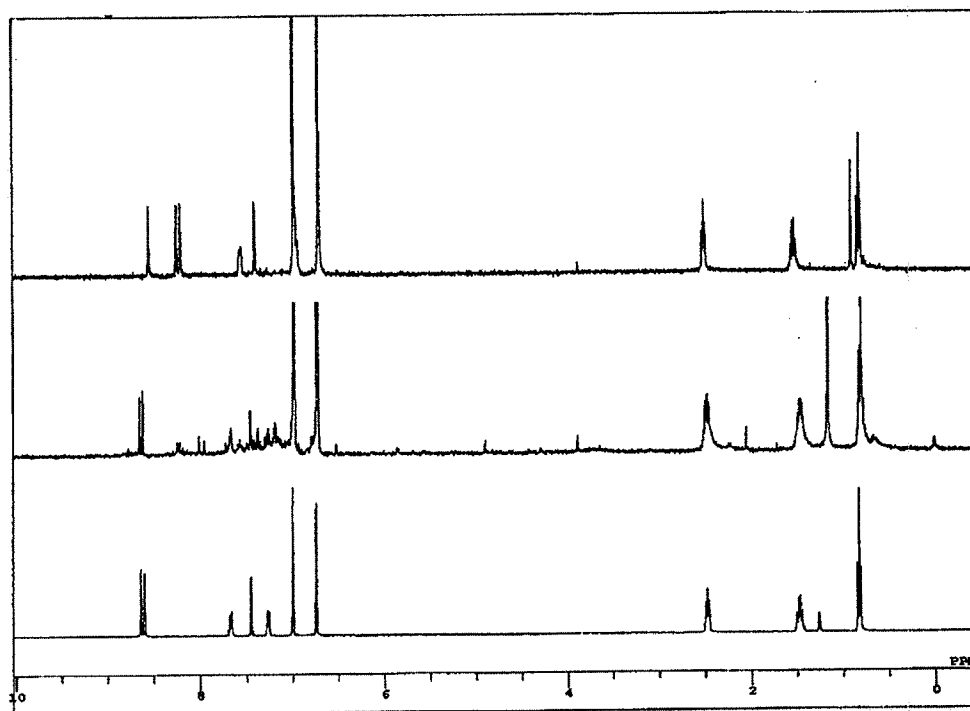


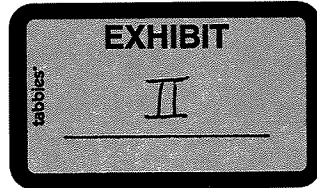
[FIG. 6]

Top Line: The ^1H NMR spectrum of the 2,3-di(n-plopyl)pentacene immediately after the solution was prepared (same spectrum as shown in FIG.3).

Middle Line: The ^1H NMR spectrum of the 2,3-di(n-plopyl)pentacene after the solution was heated for two hours (same spectrum as shown in FIG.4).

Bottom Line: The ^1H NMR spectrum of the 2,3-di(n-plopyl)-6,13-pentacene quinone.





COPY

Docket No.: 2729-0117PUS1
(Patent)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application of:

Kazuto NAGATA et al.

Application No.: 10/590,727

Confirmation No.: 2537

Filed: August 25, 2006

Art Unit: 1621

For: POLYACENE COMPOUND AND ORGANIC
SEMICONDUCTOR THIN FILM

Examiner: KATAKAM, S.

DECLARATION UNDER 37 C.F.R. § 1.132

MS AMENDMENT

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

I, Kazuto Nagata, hereby declare as follows:

I am one of the co-inventors of the invention as described and claimed in the above-identified patent application.

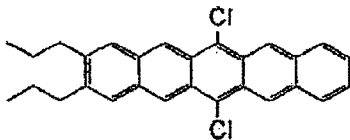
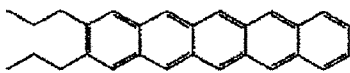
The following examples have been carried out by me or under my direct supervision in order to verify the effect on oxidation resistance by introducing the halogen group. Test procedures and results are shown below.

An oxidation resistance of the 6,13-dichloro-2,3-di(n-plopyl) pentacene recited in claim 1 of the present application and an oxidation resistance of the 2,3-di(n-plopyl) pentacene without substituting the halogen group, as a comparison example, were examined.

Method of Examination

The orthodichlorobenzene- d_4 (0.13 wt%) solution of the 6,13-dichloro-2,3-di(n-plopyl) pentacene and the orthodichlorobenzene- d_4 (0.13 wt%) solution of the 2,3-di(n-plopyl) pentacene were prepared in an NMR tube at normal atmosphere, and both of them were heated for two hours at a temperature of 80°C by an oil-bath. The decomposed amount of both cases of the pentacene were verified for a solution immediately after the solution was prepared and for a solution after the solution was heated, by measuring the ^1H NMR spectrum.

Results

| | Embodiment | Comparative Example |
|--|--|--|
| Chemical Compound |  6,13-dichloro-2,3-di(n-plopyl) pentacene |  2,3-di(n-plopyl) pentacene |
| Decomposition Rate (^1H NMR) | Less than 15% | 100% |

The decomposed rate of the 6,13-dichloro-2,3-di(n-plopyl) pentacene was about 10% after two hours of heating compared with immediately after the solution was prepared. The main decomposed compound was 2,3-di(n-plopyl)-6,13-pentacene quinone which is the oxidation-product (see FIGS. 1, 2, and 5 below). On the other hand, the 2,3-di(n-plopyl) pentacene was completely decomposed after two hours of heating, and the main product of the decomposed compound is also 2,3-di(n-plopyl)-6,13-pentacene quinone (see FIGS. 3, 4, and 6 below). This examination result strongly indicates an improving effect of the oxidation resistance by introducing the halogen group (Cl atoms).

Figure 1

The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene immediately after the solution was prepared.

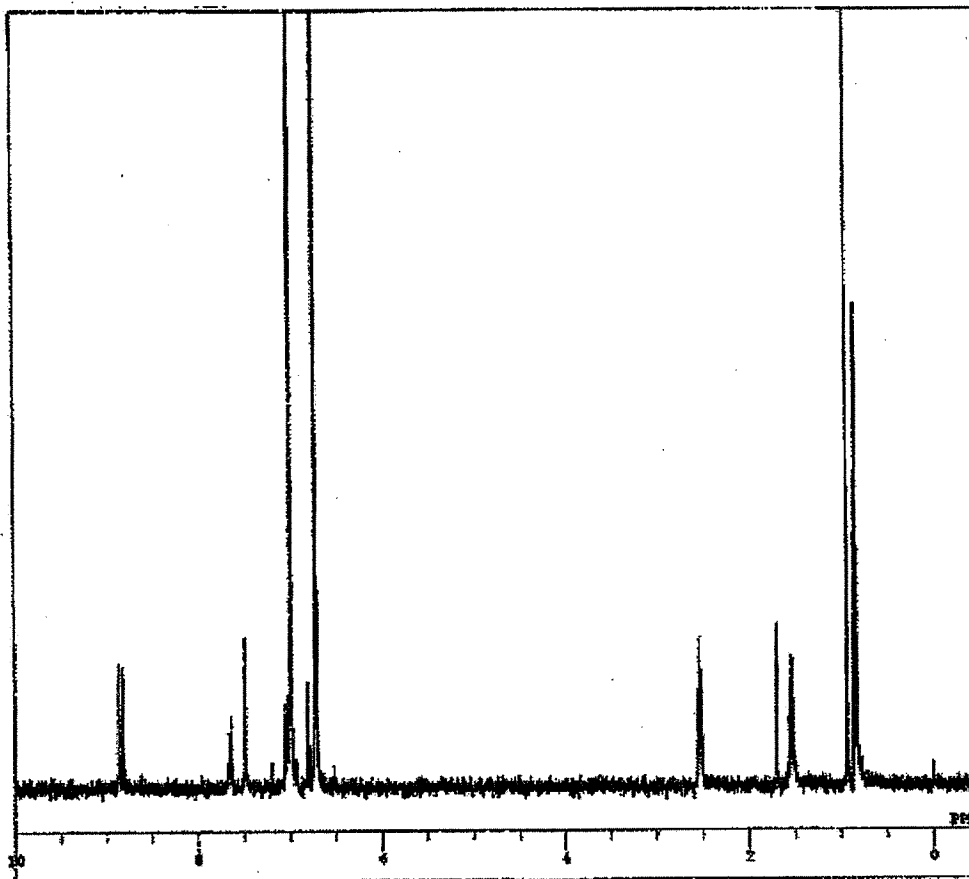


Figure 2

The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene after the solution was heated for two hours.

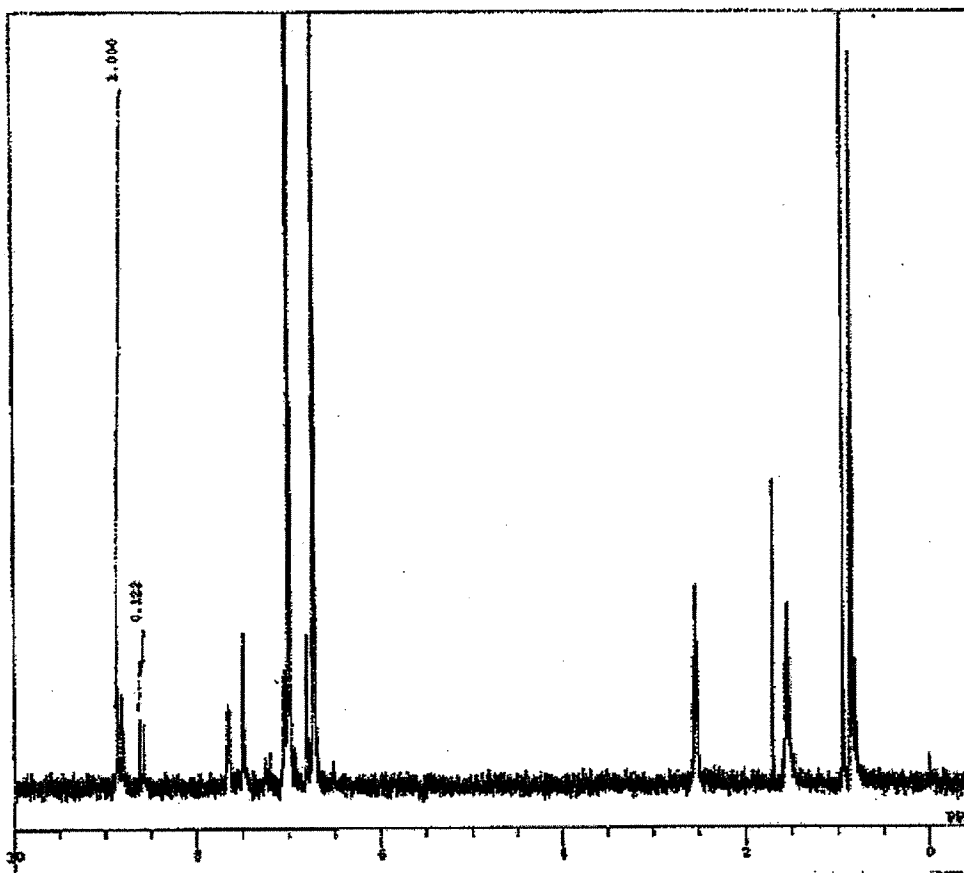


Figure 3

The ^1H NMR spectrum of the 2,3-di(n-plopyl) pentacene immediately after the solution was prepared.

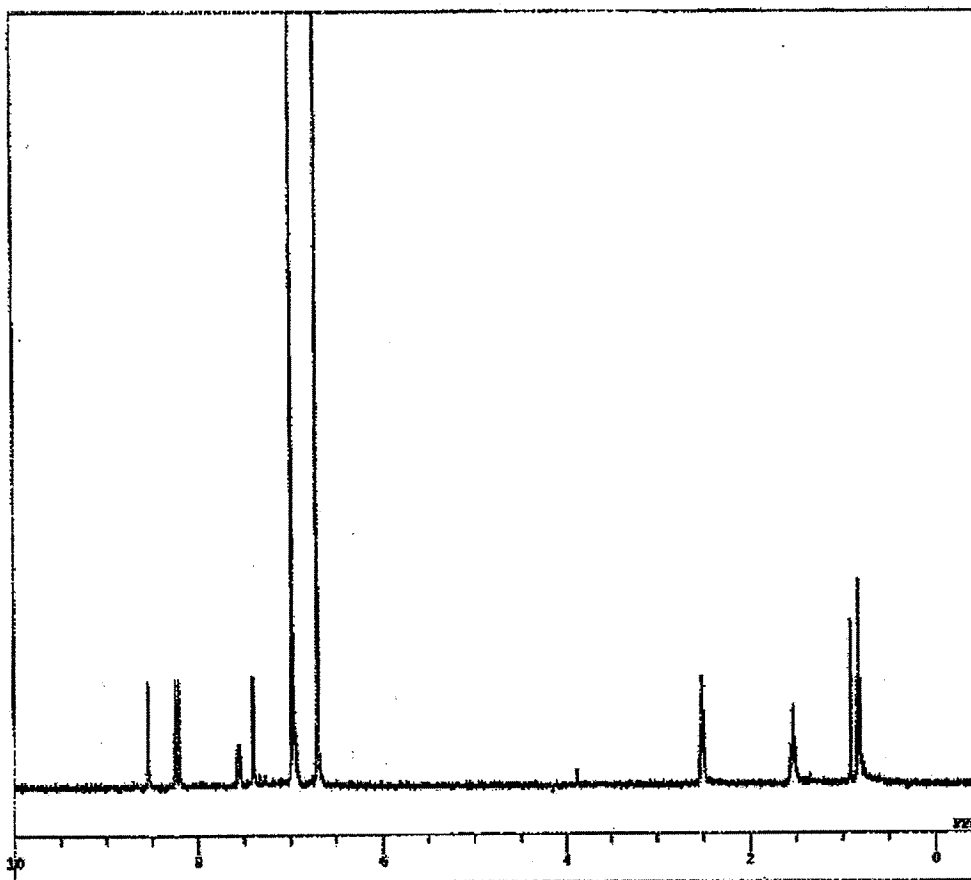


Figure 4

The ^1H NMR spectrum of the 2,3-di(n-plopyl) pentacene after the solution was heated for two hours.

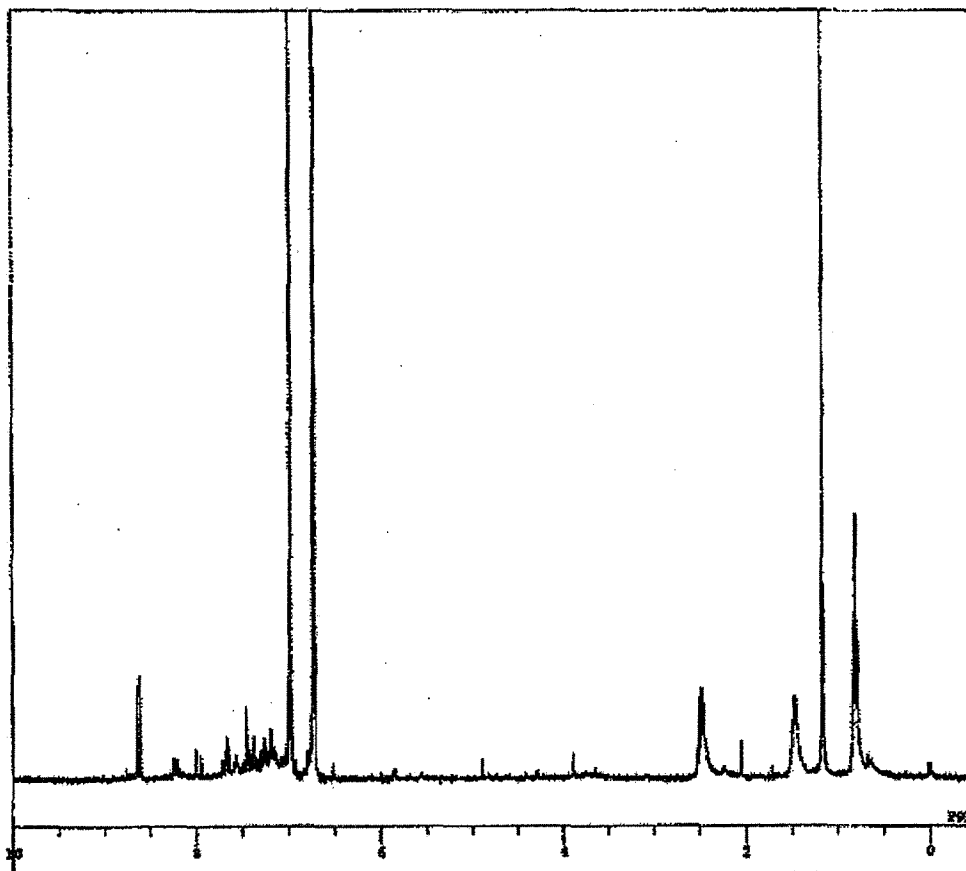


Figure 5

Top Line: The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene immediately after the solution was prepared (same spectrum as shown in FIG. 1).

Middle Line: The ^1H NMR spectrum of the 6,13-dichloro-2,3-di(n-plopyl) pentacene after the solution was heated for two hours (same spectrum as shown in FIG. 2).

Bottom Line: The ^1H NMR spectrum of the 2, 3-di(n-plopyl)-6,13-pentacene quinone.

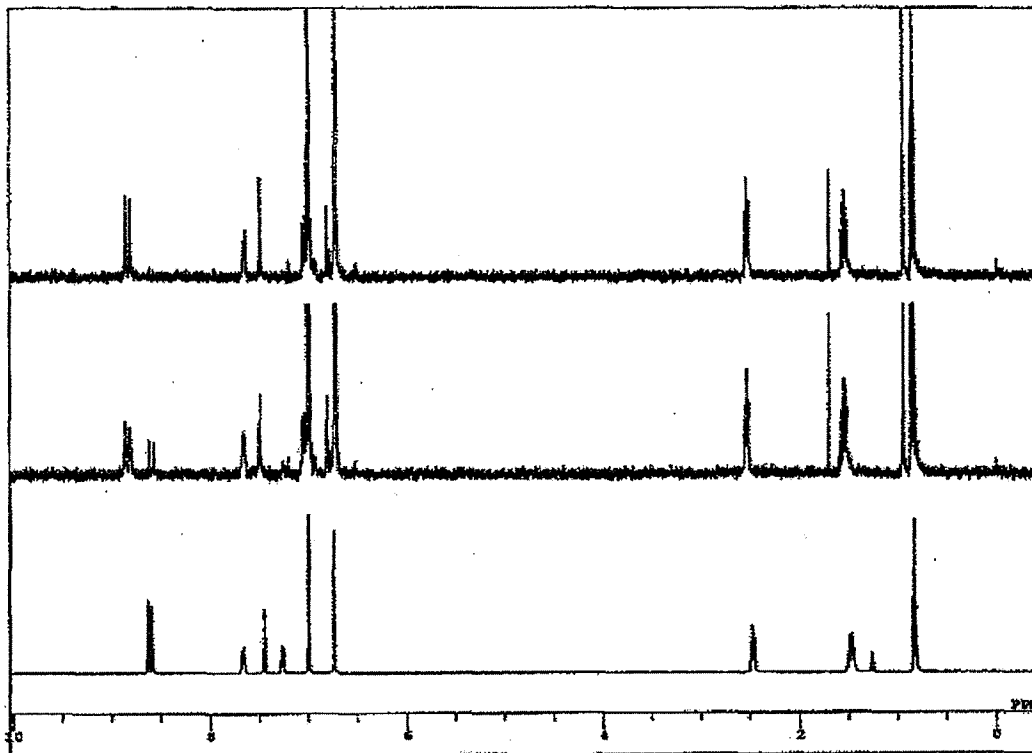
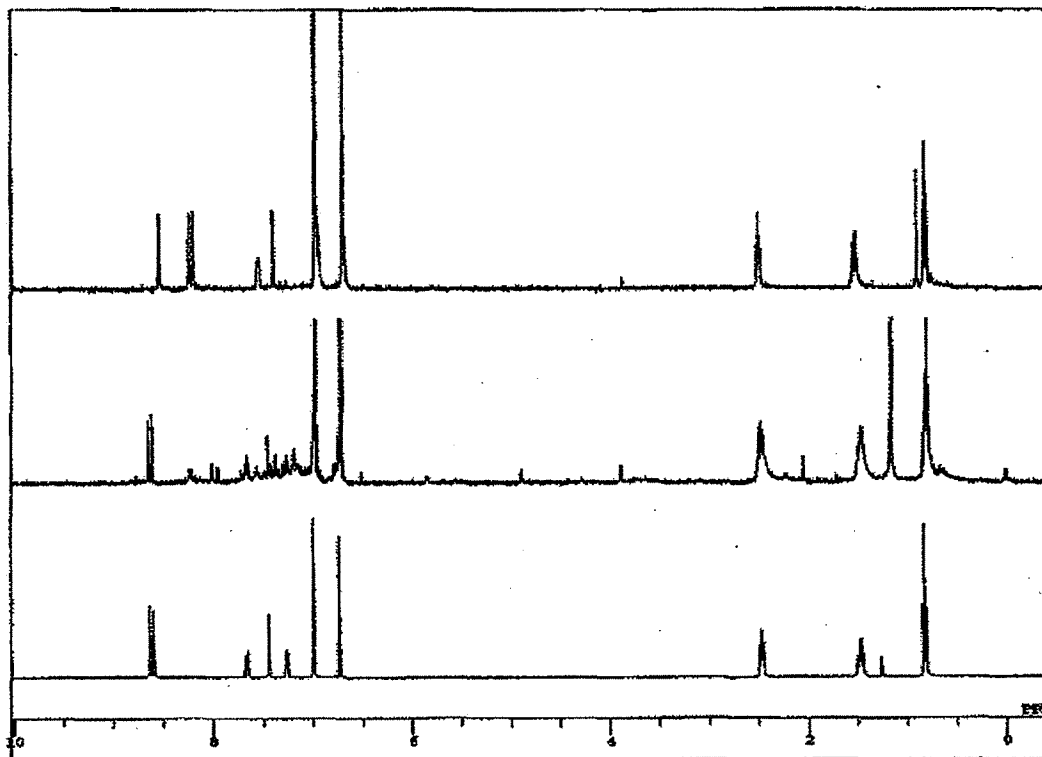


Figure 6

Top Line: The ^1H NMR spectrum of the 2,3-di(n-plopyl) pentacene immediately after the solution was prepared (same spectrum as shown in FIG. 3).

Middle Line: The ^1H NMR spectrum of the 2,3-di(n-plopyl) pentacene after the solution was heated for two hours (same spectrum as shown in FIG. 4).

Bottom Line: The ^1H NMR spectrum of the 2,3-di(n-plopyl) - 6,13-pentacene quinone.



The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S. Code 1001 and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

By: Kazuto Nagata Date: May 12, 2010